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Examiners' Report
June 2012

GCSE Design & Technology: Electronic Products 5EP02 01

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June 2012

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Introduction

This was the third sitting of this examination and it was pleasing to see candidates improving their responses to questions dealing with components, manufacturing methods, product design, environmental aspects and the various other aspects of the specification. It was particularly encouraging to see far fewer questions left blank than in previous years.

The primary purpose of the written examination is to identify whether candidates have a working knowledge of electrical systems together with an understanding of the principle of electronic design. All questions were intended to give candidates the opportunity to demonstrate this capability and to achieve marks accordingly. Analysis shows that the paper was accessible to all candidates.

The most successful candidates followed the 'command' words within the questions and provided an appropriate number of valid points, justified where required. Candidates must understand and respond appropriately when the question requires them to name, state, give, outline, describe, explain, evaluate or justify. It is difficult to achieve full marks without appropriate responses.

It is pleasing to see far fewer candidates repeating features in both of their designs in Question 12 compared to previous years. Candidates who numbered features 1 to 8 helped them to structure their responses. It was the final two specification points, relating to electrical protection and ease of disassembly which caused most difficulty here.

Some candidates continue to add additional pages. The paper contains more than sufficient space for candidates to achieve full marks for every question and it disadvantages candidates to write more than is required when they only have 90 minutes for the full examination, including reading and checking time.

Question 11(a)(i)

Most candidates identified the slide switch, although SPDT and DPDT switches were also acceptable responses.

Question 11(a)(ii)

Again, the 7 segment display was widely recognised.

Question 11(a)(iii)

The resistor restricts or reduces current, but does not slow it down.

Question 11(a)(iv)

Stripboard was recognised by most candidates as a circuit making or prototyping tool, but it is not used 'without solder'.

Question 11(b)(i)

Unfortunately, few candidates recognised the piezo/piezo electric transducer. This component is on the IEEE list of components/symbols that candidates should recognise and understand, and it is disappointing that so many candidates appeared unaware of it.

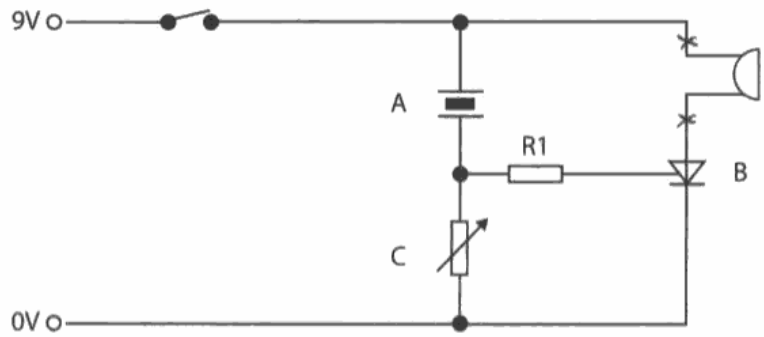
Question 11(b)(ii)

Some candidates could identify the thyristor, but not as many as expected. Generally, the same comments apply as for the piezo electric transducer mentioned above.

Question 11(c)

The correct response was for one 'X' to be on the top rail or above the buzzer, with the second 'X' between the buzzer and the thyristor.

(b) A student is making an automatic intruder alarm using the circuit below.



Name the components labelled A and B.

(2)

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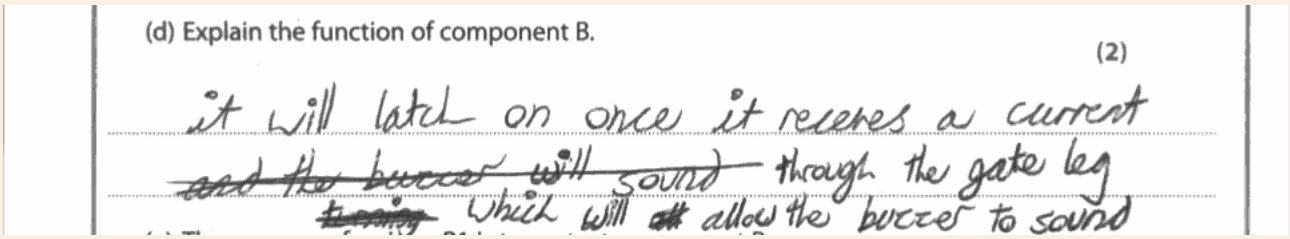
Examiner Comments

This candidate has marked the two crosses in the correct places and gained 2 marks.

Question 11(d)

In order for candidates to achieve both marks, they had to understand that the function of a thyristor is (i) to switch on and (ii) to remain on or to latch.


(d) Explain the function of component B. (2)

it will latch on once it receives a current ~~and the buzzer will sound~~ through the gate leg ~~turning~~ which will ~~not~~ allow the buzzer to sound

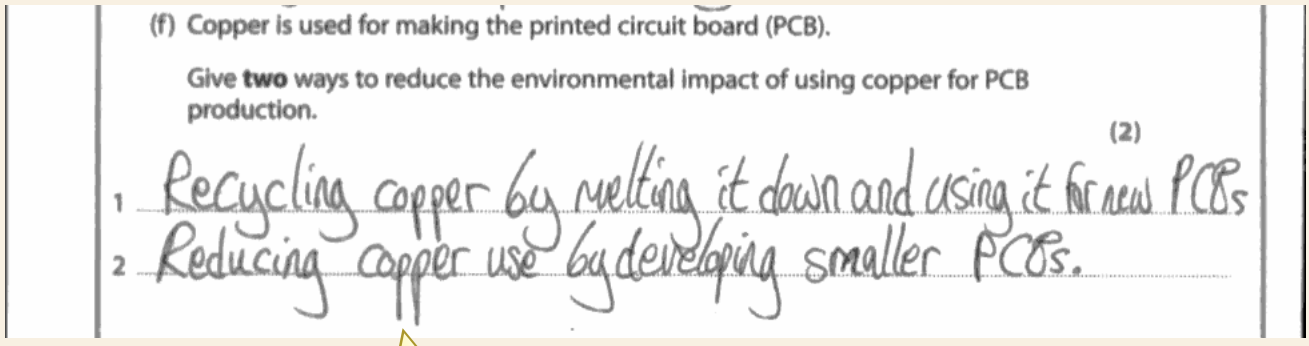
ResultsPlus
Examiner Comments
This candidate has included 'latch on' when receiving the current and therefore gains 2 marks.

Question 11(e)

Current or voltage will not damage components. The correct response was excessive current, heat, voltage, power, etc.

Question 11(f)

Smaller, thinner tracks or recycling were correct responses, but 'use less copper' does not show specialist subject knowledge and so received no marks.


(f) Copper is used for making the printed circuit board (PCB).

Give **two** ways to reduce the environmental impact of using copper for PCB production. (2)

1 Recycling copper by melting it down and using it for new PCBs
2 Reducing copper use by developing smaller PCBs.

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Examiner Comments
This candidate has given two correct ways to reduce the environmental impact of using copper for production and gained 2 marks.

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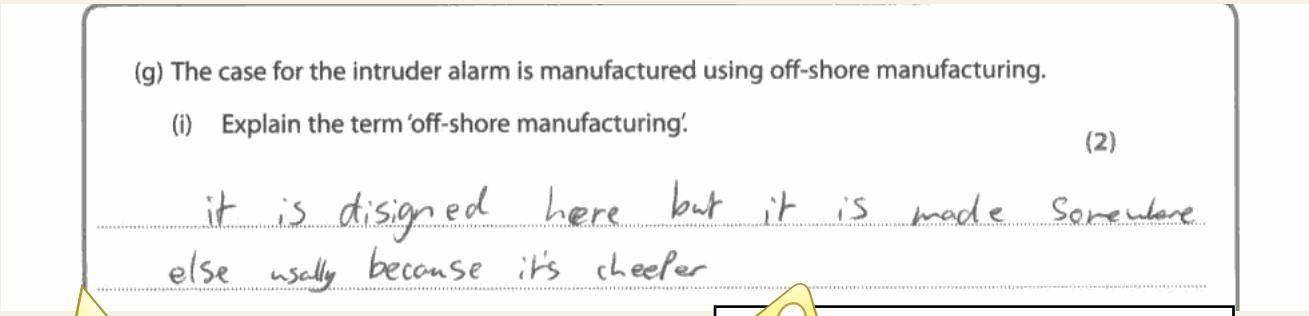
Examiner Tip
Short sentences are better than bullet points

Question 11(g)(i)

For 2 marks, the candidate was required to mention that manufacture took place in a different country, and some justification, or that the products were then reimported.



(g) The case for the intruder alarm is manufactured using off-shore manufacturing.

(i) Explain the term 'off-shore manufacturing'. (2)

it is disigned here but it is made Somewhere else usally because it's cheeper

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Examiner Comments

This response is too vague to achieve full marks. Off-shore manufacturing refers to manufacture in a different country.

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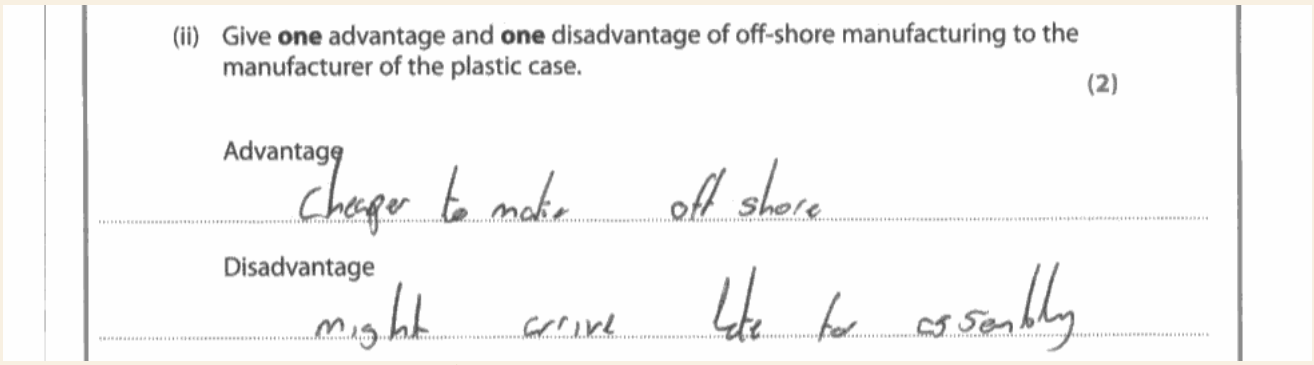
Examiner Tip

Generalised words such as 'cheap', 'fast', easy', 'efficient', etc may not achieve a mark.

Question 11(g)(ii)

'Cheaper' without qualification was not sufficient for a mark.

Candidates were asked to identify advantages for the manufacturer, so advantages for workers or for the environment were not able to realise marks.



(ii) Give **one** advantage and **one** disadvantage of off-shore manufacturing to the manufacturer of the plastic case. (2)

Advantage

Cheaper to make off shore

Disadvantage

might arrive late for assembly

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Examiner Comments

This candidate made two reasonable points and achieved 2 marks.

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Examiner Tip

These short phrases achieved full marks; single words probably would not have been enough.

Question 11(h)

(h) Give **two** reasons why High Impact Polystyrene (HIPS) is suitable for injection moulding cases, other than being recyclable and economical. **(2)**

1 It is very strong

2 it can be easily moulded.

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Examiner Comments

The question asks why HIPS is suitable for injection moulding, not why it is suitable for the product.

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Examiner Tip

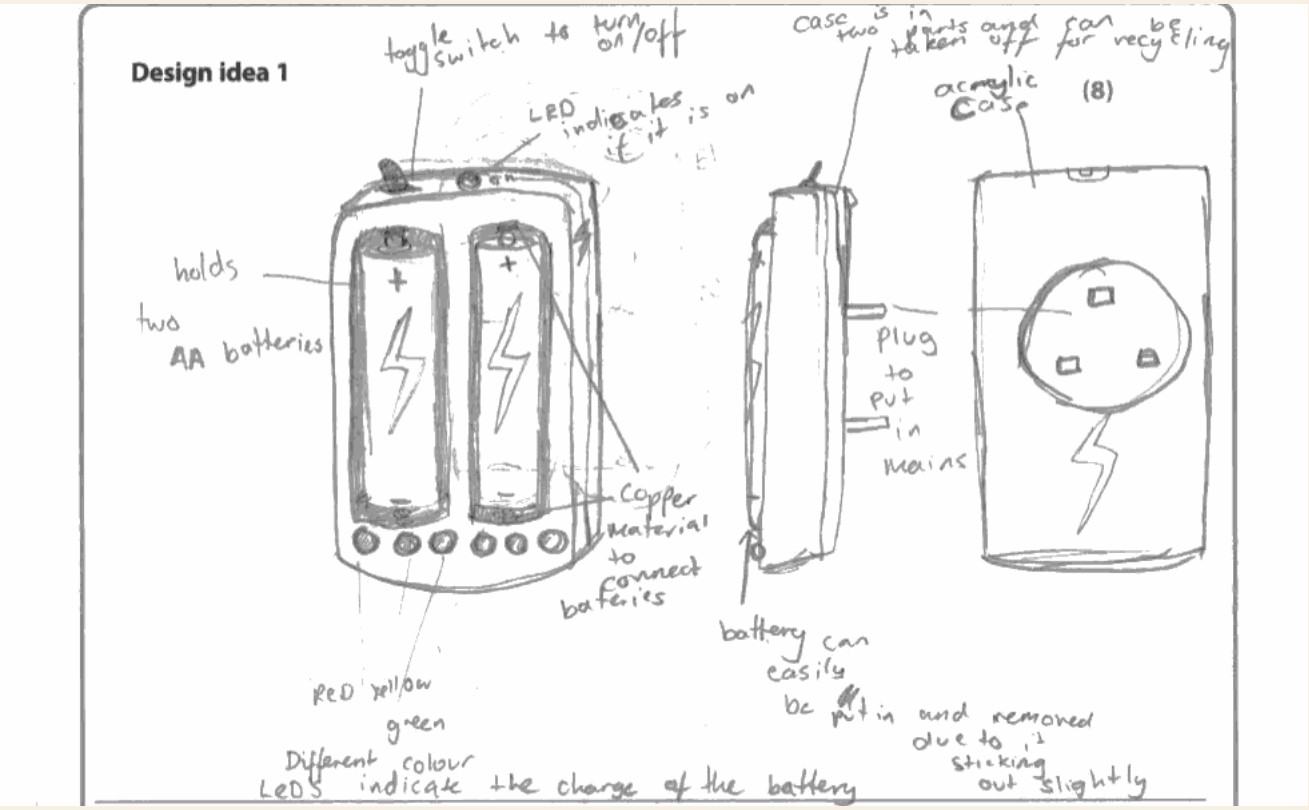
Read the question carefully. (NB also, refer to tensile or compressive strength, not just strong).

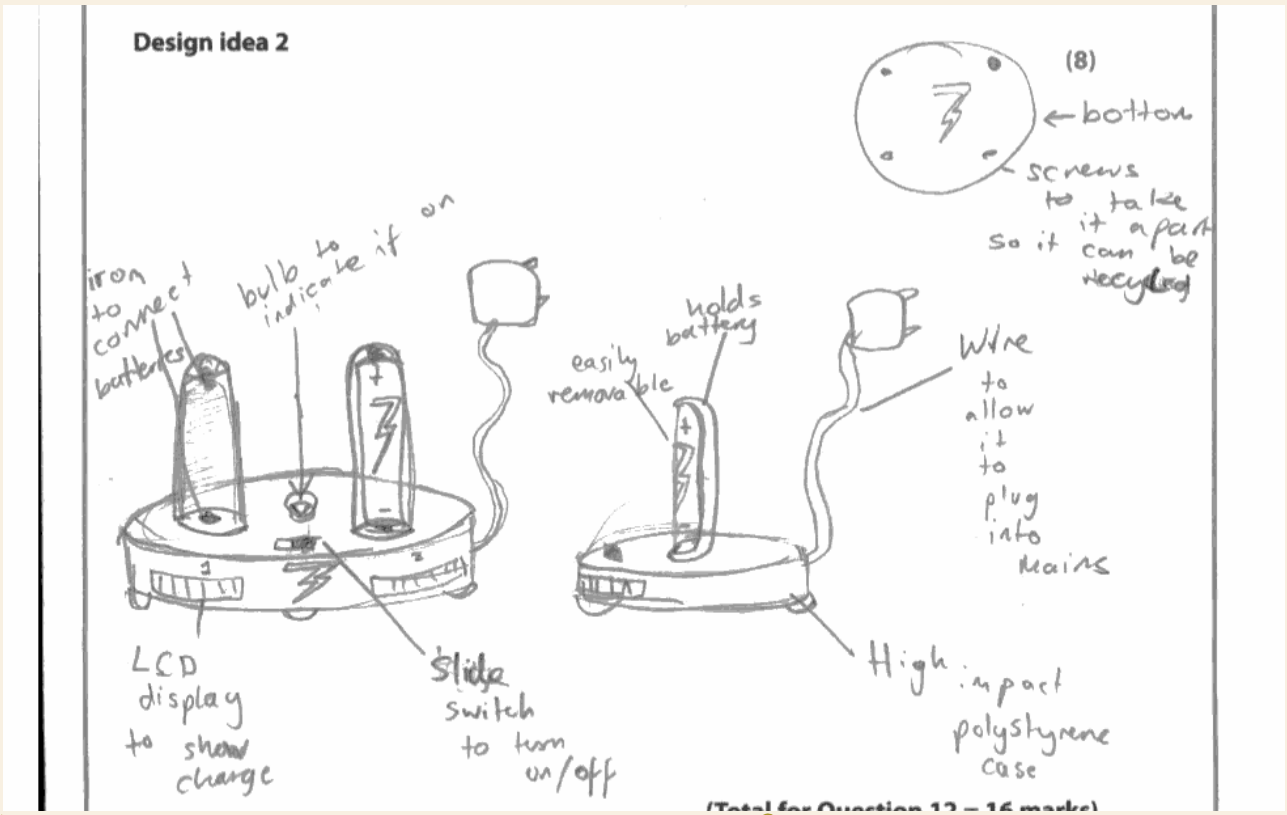
Question 12

This question was well answered with some excellent ideas which were well communicated considering the time available.

Graphical communication skills were generally better than in previous years, but there were still too many poorly presented drawings with unclear or scribbled annotation that made the marking process very difficult.

Some candidates used clear strategies for ensuring that all eight areas were addressed and none missed out. This is certainly to be encouraged.





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Examiner Comments

This is a high quality response. The candidate has clearly indicated features such as copper contacts, LED indicators, toggle and slide switches, LCD display, and so forth.

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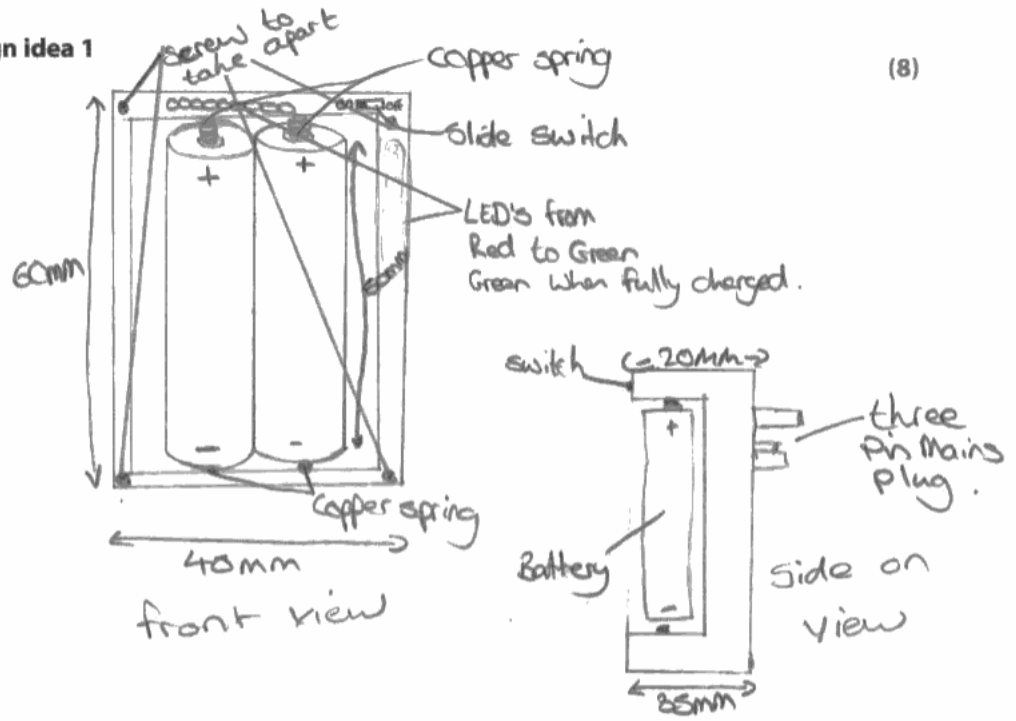
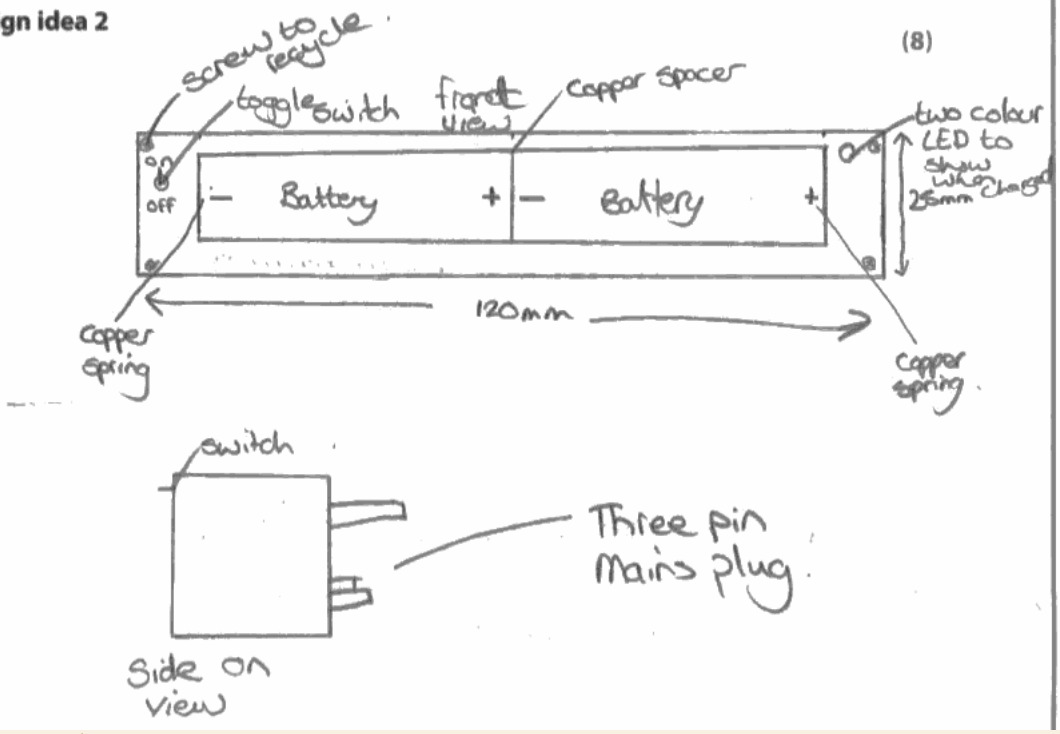
Examiner Tip

Make sure you give enough detail, eg slide switch, not switch, LED, not light. Check that you have responded to every specification point in your top design idea, and in a different way for your second design idea.

Design idea 1 (8)



Design idea 2 (8)



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Examiner Comments

This candidate has lost marks by proposing 'copper springs' and 'screws' in both design ideas. In order to achieve marks for the second design, it must address the specification points in a different way, so marks would have been awarded for, say, 'steel contacts' and 'clips together and apart' in the second design.

Question 13(a)

(a) Explain **two** reasons for using mains electricity to power this lamp. **(4)**

1 The bulb requires 60 Watts, which is equivalent to 5 car batteries, however mains electricity provides 240

2 60W bulb will consume many batteries and so it will be expensive to replace them.

1) It is intended to stay in one place and therefore does not need to be portable.

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Examiner Comments

This response achieves full marks. The candidate has given two valid points, both of which are explained.

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Examiner Tip

Where you see the word 'explain', use sentences with words such as 'so that', 'because', 'otherwise', 'and then', etc.

Question 13(b)

(b) Give **two** different ways in which the energy consumption of this lamp could be reduced. **(2)**

1 energy saver bulbs solar

2 make it ~~battery~~ powered.

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Examiner Comments

An energy saving bulb would reduce the lamp's energy consumption, but using solar power would not.

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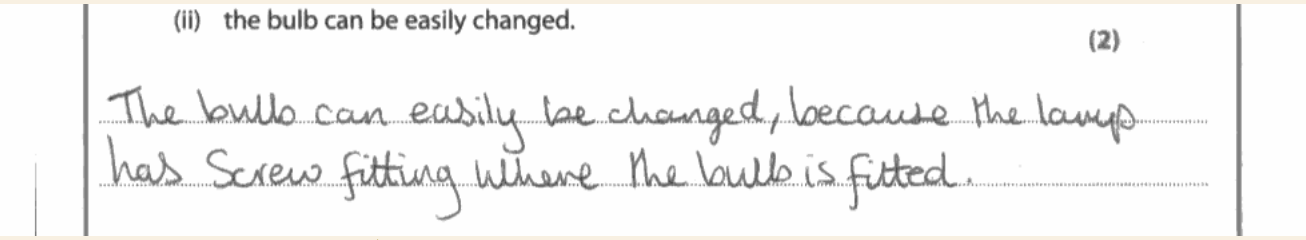
Examiner Tip

Read each question carefully.

Question 13(c)(i)

Candidates found this question very easy, with almost all suggesting that the presence of moving joints made the lamp adjustable.

Question 13(c)(ii)


(ii) the bulb can be easily changed. (2)

The bulb can easily be changed, because the lamp has screw fitting where the bulb is fitted.

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Examiner Comments

Most candidates understood this question, but many lost marks by saying that the screw fitting allowed the bulb to be *easily changed.*

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Examiner Tip

Be careful not to give an answer that just repeats the question.

Question 13(d)

*(d) The reflector is manufactured from mild steel.

Evaluate mild steel compared to acrylic as a suitable material for the reflector. (6)

mild steel is more suitable than acrylic because the acrylic will be damaged from the heat given off the ~~lamp~~ bulb and the steel will just get warm also the steel will last much longer and is much stronger if lamp were to be droped

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Examiner Comments

Although this candidate has only achieved 4 out of 6 marks, this response very clearly illustrates how the properties of steel and acrylic affect its suitablility *within the context of the reflector* by discussing the heat of the bulb and the lamp being dropped. Stating that acrylic can melt when heated and crack when dropped would achieve no marks as they are not linked to use as a lamp reflector.

Starting with a capital letter, not putting everything into one sentence and finishing with a full stop would have achieved an additional Quality of Written Communication (QWC) mark.

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Examiner Tip

Evaluate means 'with reference to', not 'state'.

Question 14(a)(i)

'OR' or 'OR gate' were the only acceptable responses.

Question 14(a)(ii)(1)

Most candidates gave correct answers and it was encouraging that almost all of those who didn't know the correct answer took the 50% gamble of guessing. It was disappointing to see digits other than 0 and 1 in some responses.

The correct response here was '0'.

Question 14(a)(ii)(2)

The correct response here was again '0'.

Question 14(a)(ii)(3)

This line required candidates to be aware of the construction of Truth Tables.

It was pleasing to see almost all candidates who identified the output correctly also listed the two correct input states.

Question 14(a)(ii)(4)

This line was intended to be the most challenging of Question 14aii. Candidates who clearly understood Truth Tables (as identified in the previous questions) could answer this question correctly.

Question 14(a)(iii)

(iii) Describe how the components connected to Input 4 produce an input signal 1 to logic gate B.

(2)

When light is directed at the LDR the resistance falls and the voltage increases through the logic gate B.

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Examiner Comments

This candidate has achieved full marks by identifying the LDR and stating that its resistance falls when light is directed onto it.

Question 14(a)(iv)

(iv) The output current from component B is too low.

Describe **one** way in which this current could be increased.

(2)

By connecting it to the base of a transistor, it can be used to allow an amplified current to flow from the collector to the emitter through the output circuit

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Examiner Comments

This candidate has correctly suggested a transistor for 1 mark and described how it would be used in the circuit for a second mark.

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Examiner Tip

'Describe' means more than 'state'.

Question 14(b)

(b) This circuit is going to be built on a printed circuit board which will be made using the photo etching process.

Give **one** advantage and **one** disadvantage of using the photo etching process. **(2)**

Advantage

The printed circuit board method is an accurate method and removes the excess copper efficiently.

Disadvantage

Uses chemicals in the process and they can be hazardous when exposed to the skin.

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Examiner Comments

This candidate has achieved 1 mark for 'accurate' and 1 mark for 'chemicals....hazardous'.

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Examiner Tip

'Give' means you only have to make one point, but a brief sentence is better than a one word answer.

Question 14(c)

*(c) Electronic circuits may be designed with pen and paper or by using circuit simulation software (e.g. Livewire, Circuit Wizard or Crocodile Technology).

Compare the use of simulation software to paper and pen when designing electronic circuits.

(6)

Designing a circuit using paper and a pen is very easy to draw and create. However using simulation software to design electronic circuits allows you to easily mend mistakes made when designing circuits, and notice where mistakes have been made, rather than drawing out a whole new circuit. Also using simulation software, one can simulate how their circuit would work before wasting materials and time on building a circuit which has not been assessed for errors and does not work. The software may even be able to detect any human errors made on the design and correct them. But the software may be expensive to purchase.

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Examiner Comments

This candidate achieves full marks for the three points; 'easily amend mistakes', 'simulate how the circuit would work' and 'expensive to purchase', with a reasonably high standard of written communication.

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Examiner Tip

When you are comparing, say good and bad things about each of the items.

Question 14(d)

(d) When an electronic product is sold, it has a barcode which is read at an electronic point of sale (EPOS).

Explain **one** advantage to the retailer of using EPOS.

(2)

They can monitor the sales of their products.

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Examiner Comments

This candidate has given no advantage or benefit of monitoring sales, so only 1 mark is gained.

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Examiner Tip

'Explain' means more than 'state'.

Paper Summary

Based on their performance on this paper, candidates should;

- Understand command words such as compare, justify and explain.
- Avoid repeating similar responses in different parts of the same answer.
- Be aware of the level of detail required at GCSE level, eg 'switch' does not show a specialist level or understanding and receives no mark, while 'slide switch' is and does.
- Evaluate when required rather than state, eg 'acrylic melts' is a statement, 'acrylic melts and so isn't suitable near a hot light bulb' is an evaluation.
- Read the question carefully, eg using a solar cell or a better reflector does not reduce the power demand of a light bulb.

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